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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE 中央 (中央) 中央 (中央)

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· 高州群人 124, 14 96 35.

Application No.:

10/812,406次// 编辑规范介绍列第

Filing Date:

March 26, 2004

Applicant:

TAKASE et al.海河 超自由率

Group Art Unit:

1742

Examiner:

MORILLO, Janelle Combs

Title:

(操作PATENTS ALUMINUM ALL

Mitting Buch

EXCELLENT IN CAULKING PROPERTY AND

EXTRUDED:PRODUCT::::://iii/iiii

Attorney Docket:

8498-000004/CO =

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

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REJECTION UNDER 37 CFR 1,132

· Friday ...

Sir:

- I, Nobuyuki HIGASHI, state as follows:
- 1. I graduated from Toyama University in 1985 with a bachelor's degree in Material Engineering.
- 2. In 1990, I started working for AISIN KEIKINZOKU CO., LTD. as an engineer in the Technical Development Department. My current position is

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Assistant Manager of Quality Group, Quality Assurance Department.

- 3. I am an inventor of the subject matter claimed in the above-identified patent application.
- 4. The claimed invention is directed to a wear-resistant aluminum alloy or extruded product that is excellent in caulking properties.

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- 5. The composition of the alloy and extruded product of the claimed invention includes 0.1 to 0.39 wt% of Mg, 3.0 to 6.0 wt% of Si, 0.01 to 0.20 wt% of Cu, 0.01 to 0.5 wt% of Fe, 0.01 to 0.15 wt% of Mn, 0.01 to 0.5 wt% of Cr, less than 0.02 wt% of Zn, and the remainder being Al and unavoidable impurities.
- 6. The wear-resistant aluminum alloyeand extruded product having the composition of paragraph 5 are suitable for use in automotive break parts for which wear resistance to sliding parts and viscosity during plastic deformation such as caulking are required.

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- 7. To evaluate caulking properties of the alloy or extruded product, the calculation of a critical upsetting ratio may be used. The critical upsetting ratio occurs when microcracks develop during compression of the alloy or extruded product.
- 8. The critical upsetting ratio of the alloy and extruded product of the claimed invention is greater than or equal to 43%.

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9. The composition of the claimed invention also satisfies the numerical expression 0.79 (wt% of Mn) ± 0.26 (wt% of Mg) ≤ 0.22, which significantly affects the critical upsetting ratio as shown in Figure 4 of the present

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application.

multiple regression analysis of the relationship between the critical upsetting ratio as an evaluation item of caulking properties and the alloy components.

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- 11. The critical upsetting ratio is significantly affected by the Mg content and the Mn content in the claimed ranges of 0.1 to 0.39 wt% and 0.01 to 0.15 wt%, respectively.
- between the expression 0.79-(wt% of Mn)+0.26-(wt% of Mg) using the coefficients calculated using the multiple regression analysis and the critical upsetting ratio (%).
- 13. As can be seen in Reference Figure 1, the horizontal axis indicates the value of 0.79 (wt% of Mn)+0.26 (wt% of Mn), and the vertical axis indicates the critical upsetting ratio (%).
- 14. The plot numbers shown in Reference Figure 1 indicate Nos. 1 to 10 shown in Figure 1 of the present application, and supplemental data Nos. 11 to 18 as comparative examples in the present application.
- 15. The supplemental data Nos. 11 to 18 were selected from the ranges disclosed in the cited reference JP 09-176769 ('769).

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16. The alloy I of JP '769 (No. 9 in Table 2-1) contains Mg in an amount of 0.40 wt%, which is greater to a small extent than the upper limit (0.39 wt%) for Mg of the claimed invention, and contains Mn in an amount within the range of

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the claimed invention. Therefore, alloy I of JP '769 (No. 9 in Table 2-1) is the prior art closest to the present invention.

- 17. Reference Figure 2, attached as Exhibit B, shows the alloy compositions and the critical upsetting ratios of the supplemental data Nos. 11 to 18.
- 18. As is clear form Reference Figure 1, alloy Nos. 1 to 6, 8 and 9 according to the claimed Invention and the supplement data Nos. 11 to 18 (comparative examples selected from JP 769) clearly belong to different groups.
- 19. When the value indicated by the horizontal axis is x and the value indicated by the vertical axis is y, alloy Nos. 1 to 6, 8 and 9 according to the claimed invention belong to a first group approximated by y = -100.46x + 65.65 (R²=0.84, linearly approximated statistically), and the supplemental data Nos. 11 to 18 belong to a second group approximated by y = -13.40x + 43.68 (R²=0.50, almost linearly approximated statistically).
- 20. The minimum upsetting ratio of the alloys according to the claimed invention shown in Figure 1 is 43.1%. In this case, the value of 0.79xMn+0.26xMg is 0.22 (upper limit).
- 21. In contrast, the supplemental data Nos. 11 to 18 which were selected from JP'769 have a value of 0.79(wt% of Mn) +0.26(wt% of Mg) of more than 0.22, as shown in Reference Figure 1.
- 22. Supplemental data No. 16 was prepared to coincide with alloy I of JP '769 (No. 9 in Table 2-1), but differs from the alloy I of JF '769 as to the Si, Fe, and Ti content by 0.02 wt%. This is the difference between the amount of

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リルデーフローコクサイトッキョラでムショ 2007 08/01 11:32 FAX 03 5209 7625 → HARNESS Ø 021/023 アイシン程金属(株)技研。 No. 4098 - - 2097年 7月318 14時46分 FAX#5:0766-29-1861 P. 022 20074 /A31H CO 10:28 שלא לפדעיו לים לים כים לי ■KA .KEFK4-PEK + EZU/IZU E 2007 07/31 09:55 FAX 03 5209 7625 P. 20 NO. 562 HARNESS DICKEY PLERC

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component added when adding each component to pure aluminum and casting an aluminum alloy and the amount of component determined by analyzing the produced aluminum alloy.

- The supplemental data Nos: 16-18 contain a Mg content that is just 23. "电压力控制活动系统" slightly outside of the claimed range of 0.39 Wt%.
- Supplemental data Nos. 16 to 18 was prepared as data 24. representing JP 769. The Mg and Mn ranges of the experimental data Nos. 17 17. [h] [2.17] (D) 6.3 and 18 were almost the same as those of the experimental data No. 16. On the that recognition to follow other hand, the SI content was increased in the order of No. 16. (SI: 4.04 wt%), No. 17 (Si: 4,52 wt%), and No. 18 (SI: 4.98 wt%).... UNIEL Jal. Movi 15 10.
- 25. Surprisingly, critical upsetting ratios of the experimental data Nos. 日本保護等的提供。1 16 to 18 are smaller to a large extent than the value (43% or more) defined in the extra Tighth 18 to daimed invention, as shown in Reference Figure 1.

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26. Quite unexpectedly, even though the comparative alloy Nos. 11 to of the most 18 that were taken from the alloys disclosed JP '769, and in particular alloy Nos. and the passed in the one of a 16-18 have a Mg content that is very close to the claimed range of 0.39 wt%, 18: 16 (31 4 to 12 W)... only the ortical upsetting ratio of the claimed combination is greater than or equal connect to blond dayling and to 43%.

Respectfully submitted, · Reference Their

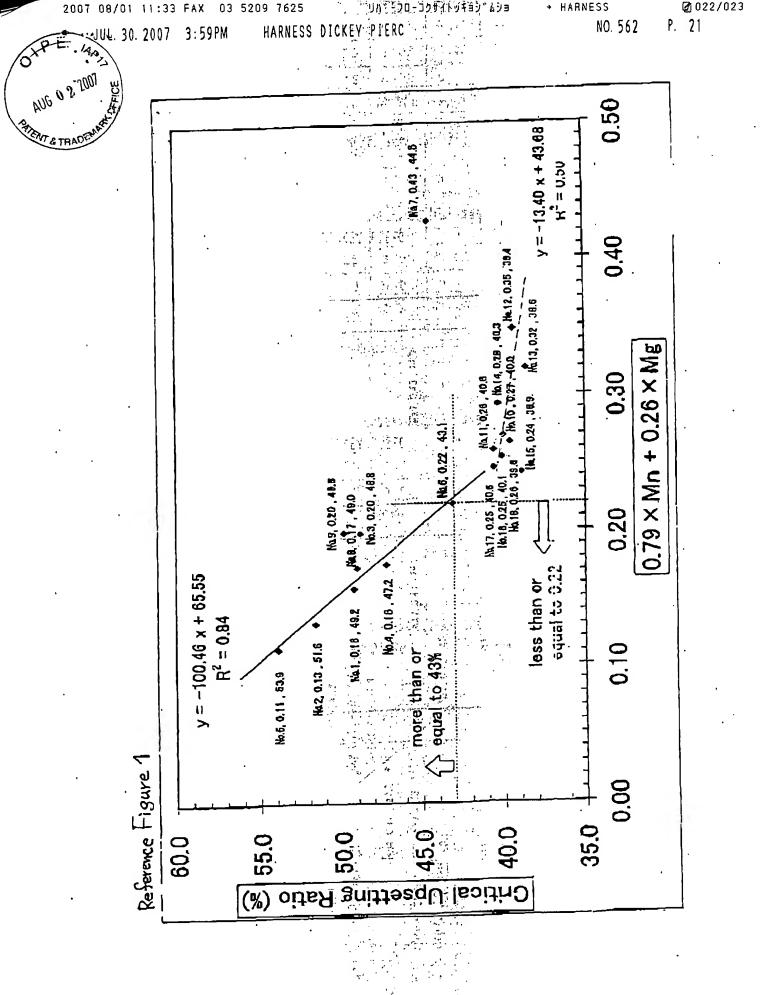
不知問的問題 Date: July 31. By Nobuyuki Higashi
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Reference Figure 2

| - | | | COMPONENTS (%) | | | | | | | CRETICAL UPSETIING |
|--|----------|------|----------------|---------|-------|---------------|------|------|-------|-----------------------|
| | йО. | Si | Fe | Cu | Ti | Mn- | Mg. | Cr_ | Zn | ratio(%) |
| COMPARATIVE | 11 | 3.85 | 0.28 | 0.15 | 0.03 | 0.16 | 0.51 | (.15 | 0.01 | 40.6 |
| | 12 | 4.96 | 0.29 | 0.16 | 0.04 | 0.24 | 0.61 | C.14 | 0.00 | 39.4 |
| | 13 | 3.97 | 1.06 | 0.14 | 0.03. | 0.20 | 0.62 | C.10 | 0.01 | 38.6 |
| | 14 | 4.17 | 0.29 | 0.96 | 0.03: | 0.18 | 0.58 | (.10 | 0.01 | 40.3 |
| | 15 | 4.59 | 0.30 | 0.15 | 0.03 | 0.11 | 0.60 | (:10 | 0.01 | 38.9 |
| | <u> </u> | 4.04 | 0.30 | 0.15 | 0.03 | 0.19 | 0.40 | (.15 | 0.01. | 40.1 |
| | 16 | | 0.29 | 0.16 | 0.04 | 0.18 | 0.40 | C.15 | 0.01 | 40.6 |
| | 17 | 4.52 | | . 40.10 | **** | 4 an a spread | 0.41 | (.16 | 0.01 | 39.6 |
| | 18 | 4.98 | 0.28 | 0.15 | 0.03 | 0-20 | 0.41 | (.16 | 0.01 | |